

## **SECTION 34 50 16**

### **FARE GATES**

#### **PART 1 – GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Entry Console
- B. Exit Consoles
- C. Reversible Consoles
- D. Accessible Consoles

##### **1.02 MEASUREMENT AND PAYMENT**

- A. Measurement: Fare gates will be measured for payment as a lump sum unit acceptably installed and tested for compliance.
- B. Payment: Fare gates will be paid for at the Contract lump sum price for fare gates or as part of the lump sum price for Fare Collection System Work, as determined by the lump sum measurement specified above, as indicated in the Bid Schedule of the Bid Form.

##### **1.03 REFERENCES**

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM A167
  - 2. ASTM A269
- B. BART Technical Documents
  - 1. Exhibit J - Fare Gate Ticket Processing Requirements
  - 2. Exhibit P - MTC Smart Card Specification
  - 3. Exhibit R - Ticket Data Format

##### **1.04 SUBMITTALS**

- A. Refer to Section 34 50 10, Fare Collection System, for submittal requirements.

## **PART 2 – PRODUCTS**

### **2.01 GENERAL**

- A. The fare gates separate the free areas in a station from the paid areas, and control entry of patrons into the system, time within the system, fare required, and exit from the system.
1. Consoles. There shall be four types of gate consoles as follows:
    - a. Entry consoles (E) are installed on the right side of an array when viewed from the free area. The entry consoles shall be equipped with an entry ticket processing module, one Smart Card Interface Device and one half of a barrier system.
    - b. Exit consoles (X) are installed on the left side of an array when viewed from the free area. The exit consoles shall be equipped with an exit ticket processing module, one Smart Card Interface Device and one half of a barrier system.
    - c. Reversible consoles (R) are installed between the entry and exit consoles in the quantities required. The reversible consoles shall be equipped with an entry ticket processing module, an exit ticket processing module, one Smart Card Interface Device at each end, and two halves of a barrier system.
    - d. Accessible Consoles (AFG) are similar in construction as the regular reversible consoles except that they are wider to permit customers in wheelchair or those with large packages.
  2. Gate Array. A typical array shall consist of one E console, one X console and in between a minimum of one R console forming at least two aisles. A three aisle array shall consist of one E console, one X console and two R consoles. A fare gate aisle shall consist of two adjacent consoles, each containing one half of a bi-parting leaf and the passageway, or aisle, between them. The width of the aisle, which is the distance between two adjacent consoles, shall be as indicated in the Contract Drawings. All aisles shall be reversible. AFGs shall be located in selected gate arrays as indicated.
  3. Ticket Insertion Bezel. The ticket insertion throat height shall be between 35 and 37 inches above the finished floor. The ticket insertion throat shall be located at least 2 inches above the bottom of the sloped face of the fare gate. Sufficient space shall be provided below the ticket bezel on the sloped face of the fare gate to allow for ticket orientation graphic specified in Article 2.02.

### **2.02 TICKET ORIENTATION**

- A. Ticket orientation when inserted into the ticket slot of the console shall be such that the magnetic stripe is on the top face and along the right edge of the ticket. The ticket contains an arrow on top to indicate the correct orientation and an orientation hole for use by the visually impaired and for use by the electronics to identify and detect proper insertion. Tickets improperly inserted shall not be transported into the ticket processing module.

**2.03 GRAPHICS AND DISPLAYS**

- A. Graphics. The graphics shall consist of the ticket orientation picture engraved below the entry bezel and the words "Insert Ticket as Shown" engraved above the bezel.
- B. End Displays. The displays shall be latent and shall become visible only upon electrical illumination for the following indications:
  - 1. International symbol for "Entry Prohibited" - a red circular display or a red "X" located at each end to alert the customer not to use that particular aisle as indicated.
  - 2. International symbol for "Entry" - a green display including an arrow pointing to the 10 o'clock position to inform the customer to use that particular aisle to enter or exit the system as indicated.
  - 3. Both symbols shall be cycled on-and-off to indicate the use of a discounted fare media, including senior, youth, disabled and student magnetic tickets and Clipper® cards. The timing and duty cycle shall be configured over the network via the EME.
- C. Ticket Insertion Display. The ticket insertion display shall be located on the top of the console near the ticket entry slot as indicated in the Contract Drawings. The illumination devices used for the display shall be high intensity Light Emitting Diodes (LED) or equivalent designed to maximize visibility under all light conditions. The display shall be latent and shall become visible only upon electrical illumination for the following indications:
  - 1. "Insert as Shown" - a flashing red message that is displayed whenever the ticket is inserted incorrectly. It shall remain displayed until the customer removes the ticket from the entry slot.
  - 2. "Out of Service" - a red message that shall be displayed to prevent the use of a particular aisle or a particular direction for that aisle. This means that a reversible console can be "Out of Service" at one end, but "In Service" at the other end. The corresponding end message for Entry Prohibited shall also be displayed.
- D. Ticket Status Display. The ticket status display shall be located on the top of the gate console near the ticket return slot as indicated in the Contract Drawings. The illumination devices used for the display shall be high intensity Liquid Crystal Display (LCD) or equivalent designed to maximize visibility under all light conditions. The display shall be latent and become visible only upon electrical illumination for the following indications:
  - 1. "Take Ticket" - a flashing white message that is displayed to inform the customer to retrieve the ticket from the exit slot and remains displayed until removal of the ticket. Deducted fare and remaining value shall be displayed.
  - 2. "See Agent" - a flashing red message that is displayed whenever the ticket or smart card cannot be processed in the normal manner.

3. "Underpaid - Go to Addfare" - a flashing red message that is displayed on exit gate consoles only when the ticket or smart card has less value than the fare for the ride just completed.
4. "Exact Fare - Ticket Not Returned" - a flashing white message that is displayed only on exit gate consoles when the value of the ticket is equal to the fare for the ride just completed.
5. "Insufficient Value - Go to Vendor" - a flashing red message that is displayed on entry gates when the ticket or smart card has less than the minimum ticket value required to enter the system.

E. Performance Requirements of Ticket Insertion Display and Ticket Status Display.

1. The displays shall have a viewing angle of at least 60 degrees measured from a perpendicular axis at the center of the display.
2. LED illumination, changes in state, and location of messages shall be visible to a person with normal vision at a distance of 10 feet from the display.
3. The size of the latent display characters shall be at least 0.2 inch wide by 0.3 inch tall.
4. The timing and duty cycle of the flashing messages shall be easily programmable from EME or the PC Notebook.
5. The size of the programmable display characters shall be at least 0.2 inch wide by 0.3 inch tall. The text, timing and duty cycle of the programmable display messages shall be easily programmable from DAS or the PC Notebook.
6. The displays shall be vandal resistant by the use of scratch and impact resistant transparent polycarbonate.
7. The LED illumination devices shall be mounted in horizontal and vertical rows in modules, which shall be the lowest level of field replaceable unit, to meet the modular design requirements of the Specifications.

## 2.04 ENTRY TICKET PROCESSING MODULE

- A. To enter the BART system and to go from the station free area into the paid area, a customer shall be required to insert a ticket in an entry ticket processing module or tag a smart card fare payment media on the smart card reader. For complete ticket processing information, refer to Exhibit J, Fare Gate Ticket Processing Requirements, which will be provided to the Supplier after Contract award and upon execution of a confidentiality agreement. The process described in these documents is summarized below. The entry ticket processing module shall process tickets as follows:

1. Ticket Insertion: Upon insertion of a ticket in the ticket bezel, the transport assembly shall check for proper ticket orientation by detecting the presence of the orientation hole to verify proper ticket insertion, and move the ticket to a

“read” station for a validity check. If a ticket without the orientation hole in the proper location is presented into the bezel, it shall not be accepted, and the message “Insert as shown” shall flash on the display. The “Insert as Shown” shall flash as long as the item remains in the entry bezel and shall turn off once the item is removed.

2. **Validity Check:** The ticket’s magnetically encoded data shall be checked for validity in accordance with Exhibit J. If the ticket is not valid, it shall be returned unaltered to the customer through the exit slot with the message “See Agent” flashing on the display, and the barriers shall remain closed. The validity check shall include:
  - a. Check ticket type;
  - b. Value greater or equal to the minimum fare on a BART Blue ticket, or greater or equal to \$0.05 ticket on a Student ticket;
  - c. Differentiate between revenue ticket and maintenance mode ticket; and
  - d. Ticket coded for entry.
3. **Encoded Data:** If the ticket is valid, the transport assembly shall move it to the “write” station where entry data shall be encoded at the specified locations on the magnetic stripe. The entry data shall be in accordance with Exhibit J, and shall include the time/day codes, the ready for exit code, and the station of entry code.
4. **Verification of Encoding:** The transport assembly shall move the newly encoded ticket to a “verify” station to verify the encoded data. If the verification fails, the ticket shall be returned to the customer and the message “See Agent” shall flash on the display. If three “write” failures occur consecutively, the console shall place itself in “Out of Service” mode.
5. **Ticket Return:** If the verification check is valid, the transport assembly shall move the ticket to the exit slot and the message “Take Ticket” shall be shown on the display. The ticket shall protrude approximately 1.5 inches above the top of the console in the exit bezel and shall be held in place by a holding brake until it is retrieved by the customer.
6. **Alternative to a magnetic stripe ticket,** the customer may tag a smart card on the reader target to initiate entry transaction at the fare gate. The customer shall leave the card on the reader target for the duration of the transaction. The same validity checks and encoding for magnetic tickets shall apply for smart cards, modified to accommodate the technical differences between tickets and smart cards.
7. **Barrier Opening:** Upon retrieval of the protruding ticket by the customer, or the completion of a smart card transaction, the barriers shall open and the message “Take Ticket” shall be turned off. The ticket processing cycle, from ticket insertion to ticket removal and barrier opening, shall permit smooth, continuous passage of the customer without unnecessary stops or delays.
8. **Entry/Exit Code:** The entry gate shall accept entry-coded tickets only. If there is a fault with the ticket/smart card encoding or if such occurrences as excessive train

delays caused the customer to abandon their journey resulting in an exit-coded ticket or smart card, an entry/exit override capability shall be given to the station agent. The override command shall make the entry ticket processing module ignore the entry/exit coding check at the entry gate and allow the customer to enter the system with an otherwise valid ticket or smart card.

9. Out of Service: When the console is not functioning properly and is in its out of service mode, the message "Out of Service" shall be displayed on top of the console and the corresponding End Display for Entry Prohibited shall be lit. In this mode, the console shall not accept a ticket into its transport nor accept a smart card tag.

## **2.05 EXIT TICKET PROCESSING MODULE**

- A. To exit the BART system and to go from the station paid area into the free area, a customer shall be required to insert a ticket into an exit console ticket processing module, or tag a smart card fare payment media on the smart card reader. For complete ticket processing information, refer to Exhibit J, Fare Gate Ticket Processing Requirements. The process described in these documents is summarized below. The exit ticket processing module shall process tickets as follows:
  1. Ticket Insertion. The process is the same as that for the entry ticket processing module.
  2. Validity Check and Fare Calculation: The read station shall decode the information encoded on the magnetic stripe. The magnetically encoded data shall be checked for validity in accordance with Exhibit J including:
    - a. If the ticket is not encoded as "ready for exit", it shall be returned unaltered to the customer thru the exit slot and the message "See Agent" shall be displayed. The barriers shall remain closed.
    - b. If the patron time within the system exceeds the allowable limit, the ticket shall be returned unaltered to the customer through the exit slot and the message "See Agent" shall be displayed the barriers shall remain closed.
    - c. If the ticket is encoded as "ready for exit" and the travel time does not exceed the time limit, the exit console shall determine the fare as required. Each exit logic package shall contain prestored fare tables which, together with the encoded station of entry, allows the exit console to determine the fare.
      - 1) If the value of a BART ticket is less than the required fare, the ticket shall be returned unaltered to the customer and the message "Underpaid - Go To Addfare" shall be displayed and the barrier shall remain closed.
      - 2) If the remaining value of a BART ticket is equal to the fare required, the ticket shall be captured, the message "Exact Fare-Ticket Not Returned" shall be displayed and the barrier shall open. The ticket shall be encoded \$0.00 value and 00.00 printed on the last print line, and the ticket shall be sent to the discard bin.

- 3) If the remaining value of a Student ticket is equal to or less than the required fare, the module shall calculate the difference and store this “uncollected fare” in the data storage as specified herein. The ticket shall be encoded and printed with \$0.00 value and returned to the patron, and the barriers shall open. It shall be possible to deactivate the “uncollected fare” function by a parameter change locally in the service keypad or remotely from DAS.
- 4) If the remaining value of the ticket is greater than the required fare, the module shall calculate the new ticket value by deducting the fare, and encode the new ticket value.
3. Encode Remaining Value: After calculation of the fare, the ticket shall be transported to the write head to encode the new remaining value onto the magnetic stripe.
4. Verify Encoded Data: The transport assembly shall move the newly encoded ticket to a “verify” station to verify the encoded data. If the verification fails, the ticket shall be returned to the customer and the message “See Agent” shall flash on the display. If three “write” failures occur consecutively, the console shall place itself in “Out of Service” mode.
5. Printing of Remaining Value:
  - a. The printing of the remaining value and replacement ticket required information shall be in accordance with Exhibit J. The printing shall be capable of being configured to print a fifth digit for the hundreds field within the designated print area.
  - b. If the printing on the BART-Blue or Student ticket has reached 21 lines and there is value remaining, a new ticket shall be issued to replace the original ticket. The new ticket shall be obtained from a supply of tickets located near the beginning of the transport. The ticket supply and feed mechanisms shall be identical in functional concept to the same equipment in the TVM, and use the same ticket rolls.
6. Ticket Return: If the verification check is valid and printing of the remaining value has been completed, the transport assembly shall move the ticket to the exit slot and the message “Take Ticket” shall be displayed. The ticket shall protrude approximately 1.5 inches above the top of the console in the exit bezel and shall be held in place by a holding brake until it is retrieved by the customer.
7. Alternative to a magnetic stripe ticket, the customer may tag a smart card on the reader target to initiate exit transaction at the fare gate. The customer shall leave the card on the reader target for the duration of the transaction. The same validity checks and encoding for magnetic tickets shall apply for smart cards, modified to accommodate the technical differences between tickets and smart cards. No printing shall be possible on the smart card, and the smart card shall not be captured.
8. Barrier Opening: Upon retrieval of the protruding ticket from the exit slot by the customer, or the completion of a smart card transaction, the barriers shall open.

The passage of the customer shall be without unnecessary stops or delays. Only one customer shall be allowed to pass per valid ticket.

9. Captured Tickets

- a. Tickets that are captured shall:
  - 1) Have their value reduced to zero magnetically;
  - 2) Have four zeros printed on the last line of the print column or have the word "VOID" printed in large fonts lengthwise down the remaining value print column; and
  - 3) Be diverted to the captured ticket bin.
- b. The capacity of the captured ticket bin shall be approximately 200 cubic inches.
- c. Smart cards shall not be captured.

10. Date/Time Code: Patron time within the BART system, as determined by the entry gate date/time codes and day/time at the exit gate shall be limited to two three-hour time codes. If there is a fault with the time encoded on the ticket or if such occurrences as excessive train delays, cause the customer to exceed the three hour limit, a day/time override capability shall be given to the station agent. The override command shall make the exit ticket processing module ignore the day/time check at the exit gate and allow the customer to exit the system with an otherwise valid ticket.

11. Out of Service: When the console is not functioning properly and is in its out-of-service mode, the message "Out of service" shall be displayed on top of the console and the corresponding End Display for Entry Prohibited shall be lit. In this mode, the console shall not accept a ticket into its transport nor accept a smart card tag.

**2.06 REVERSIBLE CONSOLE (R)**

- A. The reversible console shall contain one entry ticket processing located at one end of the console and exit ticket processing module at the other end. The applicable module shall be activated in accordance with the direction selected for the adjacent aisle. The electronics shall be identical between the consoles, and they shall also be switched to match the direction selected. All of the entry and exit functions indicated are applicable to the reversible console. Changing the direction of an aisle locally shall be accomplished by a key switch located on the paid area end of the appropriate gate console, by a keypad located within the gate console, and from DAS. After a power-off or an all barrier open command, the gates shall return to their last direction upon return to service.

**2.07 GATE BARRIER**

- A. A gate barrier shall be formed by two bi-parting leaves located in adjacent consoles that are pivoted towards each other to form a closed aisle. The barrier shall conform to the following requirements:



1. The drive mechanism shall be either pneumatic or electric.
2. Closing Force. The force to close a barrier shall be such that a customer may stall the closing motion with a force of  $10 \pm 2$  pounds per leaf. The force shall be applied at the maximum travel of the leading edge at any time throughout its stroke, including the fully closed position.
3. Response Time. Each leaf moving simultaneously shall move through its full travel within 0.45 to 0.75 second.
4. Alarm. Forcing any barrier leaf or both leaves to open beyond three inches from their normally closed condition shall activate an audible alarm, in that particular aisle, with an adjustable sound level from 65 dbA to 80 dbA measured 10 feet from the console. The alarm shall sound as long as the barrier is being forced open.
5. Mechanical Strength
  - a. A closed barrier shall be able to sustain repeated impact in both directions of travel without permanent deformations or damage. The impact shall be equivalent to a 200 pound customer moving at 3 mph and striking the barrier at the centerline of the aisle. A 300 pound downward force applied on top of a leaf shall also cause no damage.
  - b. When in the closed position, each leaf shall withstand a force of 50 pounds applied horizontally, in the direction of passage. The force shall be applied at the point of greatest leverage without causing deflection or deformation of the leaf in the force direction of more than 0.125 inch.
  - c. The leaves shall be located as indicated in the Contract Drawings. They shall be integrated into the console such that all loads generated by barrier operation shall be transmitted through the console base and into the station floor.
6. Clearance. The gap that exists at the top between two fully extended leaves shall be  $2 \pm 0.25$  inches.
7. Fabrication: Drawings of existing equipment will be made available to the Supplier to ensure conformance of the new equipment to the existing design. Each leaf shall be approximately triangular in shape and shall be molded from closed cell polyurethane, integral skin, foam with urethane foam finish. A one-piece aluminum internal leaf insert shall serve as the polyurethane mounting surface. The thickness of each leaf shall be  $2 \pm 0.25$  inches. The color required shall be orange which shall match a Rohm & Haas #2564 color chip.
8. Barrier Logic: Sensors shall be located within the consoles to detect the customer's relative location as they pass through the aisle. Based on sensor data, the barrier logic in the gate consoles shall perform the following functions:
  - a. Control the barriers by detecting customer passage, prohibiting the possibility of barrier closure on the customer, and deterring the possibility of more than one customer traversing the gate with a single ticket.

- b. Control the barriers such that they are prevented from closing, to the extent possible, prior to a customer passing through with a parcel, briefcase, suitcase, umbrella, and the like.
  - c. Open all barriers upon receipt of an “Emergency Barrier Open” command from the Station Agent Booth or DAS.
  - d. Upon loss of power, the barriers shall automatically open and remain open.
  - e. Upon restoration of power, the barriers shall return to their normally closed status.
  - f. The barrier operation shall not be affected by packages, canes, briefcases, umbrellas, and other objects that are less than six inches in length in the direction of travel and at a nominal height of three feet above the floor.
  - g. Entry into an open aisle from the closed direction shall cause the barrier to close and re-open only when the aisle is again cleared.
  - h. When the barrier is open and if the reverse direction side of the aisle is obstructed, the barrier shall close. Normal barrier operation shall return when the reverse side is cleared and a valid ticket is retrieved from the exit slot.
  - i. An obstruction lasting longer than eight seconds shall cause the aisle to go out of service. This time shall be adjustable. When the obstruction is cleared, the gate shall automatically return to service.
  - j. Monitor the status of the aisle sensors. If any sensor is blocked, the gate shall not accept a ticket into its ticket transport.
9. Leaf Relocation and Adjustment. It shall be relatively easy to relocate or adjust the leaves between the two possible locations on either side of the console in order to align properly with the leaf in the adjacent console to form an appropriate barrier.

## **2.08 FARE BANKING**

- A. Banking refers to the transaction whereby tickets or a combination of tickets and smart cards are processed by the gate console, one after the other, up to a maximum of 10, followed by the banked customers walking through an open aisle. After the last banked customer has passed through, the barrier shall close automatically and revert to its normal operating mode. During banking, the barrier shall remain fully opened, without any movement or hesitation.

## **2.09 TRANSACTION TIME**

- A. The transaction time for individual transactions shall be as follows:
  - 1. A maximum of 0.90 second for an entry console to complete a transaction. (from time ticket is inserted to time ticket is returned).

2. A maximum of 0.90 second for an exit console to complete a transaction which does not require issuing a new ticket. (from time ticket is inserted to time ticket is returned to the customer)
3. A maximum of 1.50 seconds for an exit console to complete a transaction involving a ticket replacement operation.
4. A maximum of 0.30 second for the barrier to open (from the time ticket is retrieved from ticket slot).
5. Logic Reset Time: After maintenance service, the time for the gate console to return to service after the console doors are closed shall not exceed 3 seconds.

## **2.10 CUSTOMER FLOW RATE**

- A. Entry and exit gates shall be able to process customers at a minimum rate of 30 persons per minute, assuming trained customers, valid tickets or smart cards and no ticket replacement for 21 print lines.

## **2.11 GATE CLOCK**

- A. The gate clock shall have the capability of being set locally and synchronized remotely from the DAS and shall provide the following time and date information:
  1. Time Tagging. Each transaction and event shall be time tagged.
  2. Time Code for the BART Ticket. Each transaction shall be tagged with a time code with resolution of one minute during the day.
  3. Day/Month Code for the BART Ticket: The day and month of the transaction shall be encoded on the ticket.
  4. Peak/Off Peak Fare: The clock shall automatically control the time periods selected for these two categories of fares. It shall also be possible to manually select the fare categories from the local maintenance keypad and from EME.
  5. Time/Date Information for Student, and possibly for other tickets to be introduced by BART in the future, consisting of:
    - a. Time in hours, minutes, and seconds in both 12-hour and 24-hour formats
    - b. Julian date
    - c. Day of week
    - d. Day of month
    - e. Month
    - f. Year
    - g. Leap Year

- h. Daylight Savings Time
- i. Month code
- j. Year code

## **2.12 TICKET TRANSPORT ASSEMBLY**

- A. The ticket transport assembly for the gate consoles shall conform to the same basic concept and other appropriate features as indicated for the TVM as specified in Section 34 50 13 - Ticket Vending Machines, and AFM as specified in Section 34 50 10 - Fare Collection System.

## **2.13 MICROPROCESSOR ASSEMBLY**

- A. The Microprocessor Assembly shall control all operating functions of the fare gate. It shall control the performance and timing of all other assemblies, sub-assemblies, modules and displays in the faregate; and control and monitor the barriers and passenger aisle. The operating system, data and application programs shall be inherent in each Microprocessor Assembly to allow each faregate aisle to operate as a stand-alone aisle. The failure of any Microprocessor Assembly in the array shall only affect the gate aisle controlled by that Microprocessor Assembly. All other aisles shall remain operational. There shall be no dependency on the communication link. It shall be possible to download all configuration parameters, faretables, and applicable software programs into the gate consoles remotely from the DAS and locally from the PC Notebook. The Microprocessor Assemblies in the gate consoles shall be identical and interchangeable. The Microprocessor Assembly shall satisfy the requirements of either the entry or exit mode upon selection of one or the other by a local or remote switching command. The Microprocessor Assembly shall monitor the fare gate such that a change in aisle direction shall not be allowed during a transaction or during an apparent queue situation.
- B. Chip Quality: Same requirements as for the TVM, as specified in Section 34 50 13 - Ticket Vending Machines.
- C. Data Storage
  - 1. Non-Volatile RAM Storage: Non-volatile RAM storage shall be provided to store critical data in non-resettable registers to serve as backup in the event of failures in the communication link or the DAS. The RAM storage shall record all ticket transaction and event data as they occur, and shall be designed to be polled from DAS and to allow local extraction of stored data when connected to the specified PC Notebook. The RAM storage shall be divided into two partitions, the "current period" and the "previous period". The current period shall contain the data since the gate was last polled by the DAS or the PC Notebook. The previous period shall contain the last polled data. The RAM storage shall be adequate to store the current and previous period accumulated data for at least 30 days. For the individual ticket transaction data, the RAM storage shall have the capacity to store 50,000 transactions or three days worth of data, whichever is greater, for both the current and previous period. Upon loss of power, the stored data shall remain intact for at least 30 days. The RAM storage shall be

adequate for the storage capacity indicated plus a reserve of 300 percent of the capacity used. Expansion shall be possible with the simple addition of memory boards or chips. Hard disks shall not be used for faregate data storage.

2. Data to be Stored: Data to be stored by the gate consoles shall include but not be limited to the following:

- a. Entry Console

- 1) Accumulated number of tickets/Smart Cards by type.
- 2) Accumulated number of ticket jams.
- 3) Accumulated number of events by event type.
- 4) Real-time and polled data as defined hereunder.

- b. Exit Console

- 1) Accumulated number of tickets/Smart Cards processed by type.
- 2) Accumulated value of fares deducted by total and by ticket/Smart Card type.
- 3) Accumulated number of ticket jams.
- 4) Accumulated number of tickets dispensed from ticket supply.
- 5) Total uncollected fare (Last Ride Bonus).
- 6) Accumulated number of events by event type.
- 7) Real-time and polled data as defined hereunder.

- D. Data Interface:

1. Real Time. Real time data shall be transmitted to the DAS as soon as the events occur, in real time. The data to be transmitted shall include but not be limited to the data indicated below. The data transmission process shall be accomplished with no degradation to system performance and transaction times.

- a. Entry data for each ticket transaction:

- 1) Console identification number;
- 2) Station location;
- 3) Date;
- 4) Time in hour, minute, second;
- 5) Valid entry;
- 6) Ticket/Smart Card type;
- 7) Ticket/Smart Card serial number; and
- 8) Smart Card data as defined in Exhibit P.

- b. Exit Data for each ticket transaction:

- 1) Console identification number;

- 2) Station location;
- 3) Date;
- 4) Time in hour, minute, second;
- 5) Ticket/Smart Card type;
- 6) Ticket/Smart Card serial number;
- 7) Station of entry;
- 8) Fare deducted;
- 9) Remaining value of Ticket/Smart Card;
- 10) Uncollected fare (Student only);
- 11) Ticket replacement;
- 12) Valid exit;
- 13) Smart Card data as defined in Exhibit P;
- 14) Captured ticket (exact fare); and
- 15) Captured ticket (ticket printed on last line).

c. Events:

- 1) Console identification number;
- 2) Station location;
- 3) Date;
- 4) Time in hour, minute, second;
- 5) In service;
- 6) Out of service;
- 7) Direction of travel (entry or exit);
- 8) Event code or Failure code;
- 9) Near full discard bin indication;
- 10) Low ticket supply indication;
- 11) Faregate barrier open/close status;
- 12) Entry/exit override on/off status;
- 13) Time/day override on/off status;
- 14) Time/date of occurrence;
- 15) Faretable in use (faretable number);
- 16) Faregate in maintenance mode;
- 17) Personnel ID code; and
- 18) Performed function code.

d. Equipment Condition and Summary Data:

- 1) Number of failure/malfunction incidents by type;
  - 2) Number of service and warning incidents by type;
  - 3) Number of access to ticket handling mechanism;
  - 4) Number of legitimate entries (accessible faregate only);
  - 5) Number of forced entries (accessible faregate only);
  - 6) Number of tickets in reject bin; and
  - 7) Inventory of replacement tickets.
2. Polled Data. Polled data for either the current period or the previous period shall be sent to DAS upon request (poll). The data shall include but not be limited to the following:
- a. Console identification number;
  - b. Station location;
  - c. Date;
  - d. Time in hour, minute, second;
  - e. Number of entries since last successful poll, by ticket/Smart Card type;
  - f. Number of exits since last successful poll, by ticket/Smart Card type;
  - g. Cumulative number of entries since last successful poll, by ticket/Smart Card type;
  - h. Cumulative number of exits since last successful poll, by ticket/Smart Card type;
  - i. Amount of fare collected since last successful poll, by ticket/Smart Card type;
  - j. Uncollected fare (Student) since last successful poll;
  - k. Cumulative fare collected, by ticket/Smart Card type;
  - l. Cumulative uncollected fare (Student);
  - m. Complete list of events with date and time since last successful poll; and
  - n. Entry/exit data for each transaction and Event Data as indicated herein.
3. Commands. Commands shall be executable from DAS. In the event of loss of communication with the DAS, these commands shall be executable on a local basis for an array, preferably, or individual gate console from the PC Notebook or the maintenance keypad. The commands shall include but not be limited to the following:
- a. Change the direction of an individual aisle;
  - b. Change the direction of an array of gates;
  - c. Place a selected gate in or out of service;
  - d. Place a selected array in or out of service;

- e. Open or close an individual aisle;
  - f. Open or close an array;
  - g. Override the entry/exit check;
  - h. Override the day/time check;
  - i. Synchronize the clocks;
  - j. Request poll; and
  - k. Poll fare gate.
4. Downloading. Gate parameter and configuration files shall be downloadable from the DAS to an individual console or a group of consoles. The data shall include but not be limited to the following:
- a. Fare tables; and
  - b. Changes to system variables.

## **2.14 MAINTENANCE MODE**

- A. Each console shall have a maintenance mode switch. When in the maintenance mode, a fare gate, either entry or exit, shall only accept a maintenance mode ticket. When a maintenance mode ticket is processed, all functions except the entry/exit check shall be performed for that type of ticket except that the transaction as stored in the non-volatile memory and transmitted to DAS shall be identified as a Maintenance Mode Transaction. A mechanical switch shall be provided to place the unit in maintenance mode. An internal indicating light or display shall indicate that the fare gate is in maintenance mode. The console shall automatically return to revenue mode when top lid is closed. The faregate, when in Maintenance Mode, shall also process a "7F" ticket as described in Exhibit J.

## **2.15 MAINTENANCE DISPLAY/KEYPAD**

- A. An LED, LCD, or equivalent display shall be used along with an internally mounted keypad to enable troubleshooting of the console. The keypad shall have the capability to access diagnostic function and perform such tasks as exercising the logic networks and mechanical modules.
- B. Safeguards shall be employed to assure that changes to the software cannot be performed unless it is performed by authorized personnel, and a secure and pre-approved procedure is followed.
- C. Failure codes shall be displayed. Failure codes for each type of gate console shall encompass failure codes reported by each subcomponent. Diagnostics of the micro-sub logic and memory storage shall be continuous and automatic. Diagnostics shall also be possible through the specified PC Notebook. The following failure codes with brief text descriptions shall be provided, as a minimum: (To be developed).



- D. A standard serial or parallel port shall be provided to connect to the PC Notebook for additional testing, for local printouts of statistical data, or for downloading the data in RAM, locally when necessary.

## **2.16 LOSS OF ENCODED DATA**

- A. In case of partial loss of encoded data on the magnetic stripe, the entry and exit ticket processing modules shall process tickets under the following conditions:
  - 1. BART, BART Plus and Student: Tickets under the following conditions shall be processed provided that the other acceptance criteria specified in Exhibit R are met:
    - a. One partially erased VEND word.
    - b. One partially erased VEND word, and one partially erased DATA word.
    - c. One partially erased DATA word.

## **2.17 EXIT GATE PRINTER**

- A. The printer in the exit gate shall print the remaining value of the ticket in the column provided, and shall print required information on replacement tickets as shown in Exhibit J. The printer shall be either a dot-matrix impact printer or a thermal printer, and shall conform to the printer requirements specified in Section 34 50 13 - Ticket Vending Machines for the TVM.

## **2.18 ACCESSIBLE FARE GATE**

- A. General. The Accessible Fare Gate shall permit wheelchair customers to gain access to the paid area. It shall also serve as a service gate, emergency exit gate, and as a backup to the regular gate array, when required, and shall provide convenient access to customer with large packages, bicycles, strollers, and the like.
- B. Accessible Gate Console. The “accessible gate console” shall be of similar construction as the regular reversible gate console with the exception of the following additional requirements:
  - 1. The width of the aisle shall be 42 inches minimum.
  - 2. The barrier shall consist of either electrically operated telescopic bi-parting leaves, a single electrically operated swing gate, or electrically operated bi-parting swing gates.
  - 3. Access to internal components shall be possible from either side to permit the installation of either side against a wall.
  - 4. The ticket entry bezel shall be epoxy coated a bright red or equal. The bezel design shall be subject to BART approval.

5. The international accessible sign shall be affixed to both ends of the console just below the arrow.
  6. Where applicable, the DAS and Hardwired Communication Interface shall be identical to the regular reversible gate console.
  7. Ticket processing shall be identical to the regular reversible gate console except that the console shall automatically set itself into the proper directional mode depending on whether the entry or exit slot has sensed the ticket insertion. Once a slot has sensed a ticket insertion, the other slot shall not accept a ticket insertion until the transaction from the first insertion is completed and the passenger has cleared the aisle.
  8. The gate console shall return the ticket to the slot into which the ticket was inserted.
  9. The top display shall be located so it can be seen either by a walking customer or by a customer in a wheelchair. A side display shall be provided to accommodate wheelchair customers.
  10. The gate console shall be designed to be placed at the end of an array, either against a wall or against a low barrier perpendicular to the array.
  11. The gate console shall be designed to allow for either left or right hand ticket insertion.
- C. Gate Barrier for Telescoping Bi-parting Leaves. The gate barriers for the telescoping bi-parting leaves gate concept shall conform to the requirements of the barriers for the regular gate except for the following:
1. The drive mechanisms shall be electrically or pneumatically operated.
  2. Each barrier shall be approximately triangular in shape and shall consist of no more than 2 telescoping leaves.
- D. Gate Barrier for Single Swing Gate. The gate barrier of the single swing gate concept shall consist of a rectangular metal frame with the following features:
1. Swings about the vertical axis of its mounting a full 90 degrees in each direction from its closed position.
  2. Fully opens automatically upon processing of a ticket, in the direction away from the end of the console where the ticket was inserted.
  3. Fully closes automatically upon completion of passage of patron.
  4. The barrier shall have a smooth surface on both sides extending from two inches above the floor to 27 inches above the floor.
  5. The top of the barrier shall be from zero to four inches below the top of the console.

6. The international accessible sign shall be affixed to both sides of the barrier. It shall be centered on the barrier and it shall be sized to fill a 10-inch square in correct proportions. Colors to be used will be provided by the District.
  7. It shall take no more than 5.0 pounds of force, applied at the center of the top of the barrier to force open the barrier to its fully open position.
  8. The barrier shall move through its full travel within 2.0 seconds.
  9. A 300 pound downward force applied to the top of the barrier shall cause no damage to the barrier or to the drive mechanism.
- E. Gate Barrier for Bi-parting Swing Gates. Each barrier of the bi-parting swing gate concept shall conform to the requirements of the single swing gate concept and the following additional requirements:
1. Clearance. The gap that exists between the two barriers at the closed position shall be less than 1 inch +/- 0.25 inch.
  2. Fully opens automatically upon processing of a ticket, in the direction away from the end of the console where the ticket was inserted.
  3. The movement of the two barriers shall be synchronized.
  4. The drive mechanism for each barrier shall be coupled such that forcing one barrier open shall cause the other barrier to open. It shall take no more than 5.0 pounds of force, applied at the top-center of either barrier to disengage the drive mechanisms to move the barriers to their fully open positions.
  5. A 300-pound downward force, applied to the top of either barrier shall cause no damage to that barrier or to its drive mechanism
- F. Enclosure. The enclosure shall support the gate barrier and shall contain the mechanical closure mechanism and the barrier damping devices. All components shall be located within the enclosure. Power and communication cables to under floor ducts shall be required. Anchoring provisions into the structural concrete floor shall be provided as required.
- G. Alarms: Alarm conditions shall be transmitted to DAS.
1. Audible Alarm. The accessible gate console shall contain an audible alarm with a sound level of 80 dbA maximum, measured 10 feet from the barrier. The sound level shall have a continuous adjustment or settings possible at 25, 50, and 75 percent below the maximum level. An externally accessible key switch shall be provided to deactivate the alarm. Alarm shall sound under the following conditions:
    - a. The barrier is forced open.
    - b. The barrier fails to close after a customer passes or within an adjustable time period between 5.0 and 25.0 seconds after a valid opening. The alarm shall sound until the barrier is closed.

2. Intrusion Alarm. A “barrier forced open” condition shall cause an intrusion alarm to be sent to DAS as a real-time event, and to the Hardwired Communication Interface in the form of a relay contact closure.
3. Barrier Logic. The Accessible Fare Gate barrier logic shall perform the following functions:
  - a. Control the barrier by detecting customer passage, prohibiting the possibility of barrier closure on the customer.
  - b. Control the barrier such that it is prevented from closing to the extent possible, prior to a customer passing through with large packages, a bicycle, a stroller, and the like.
  - c. Open the barrier upon receipt of an “Emergency Barrier Open” command from the Hardwired Communication Interface or DAS.
  - d. Upon loss of power, the barrier shall automatically open and remain open. Upon restoration of power, the barrier shall automatically close.
  - e. Conform to the fare banking requirements specified herein.
- H. Fabrication Materials. The frame of the barrier and the gate cabinet shall be constructed of stainless steel plates and tubing in accordance with ASTM A167 and ASTM A269, respectively, type 304L, number 4.0 finish, fully welded. All signs shall be covered with polycarbonate or equal to be scratch resistant. The transparent barrier shall be a hard and durable polycarbonate such as Lexan MR-5000 or approved equal.
- I. Mechanical Strength. The closed barrier and mounting post shall be able to sustain impacts in both directions of travel without deformations or damage. The impact shall be equivalent to a 200 pound customer in a wheelchair moving at 4.0 mph and striking the barrier at the centerline of the aisle.

## **2.19 CONTACTLESS SMART CARD INTERFACE DEVICE**

- A. Smart Card Interface Devices (CID) for use with the smart card fare media shall be provided on all gates and accessible fare gates as indicated. The module shall communicate with the card using the contact less interface. The CID shall be conveniently located on the gate console so that a customer can present the fare media in a very natural manner, possibly without having to remove the smart card from a wallet or a purse. Encoding format and processing requirements by the gates shall be in accordance with Exhibit P, MTC Smart Card Specification.

**2.20 BATTERY BACK-UP**

- A. The battery back-up shall meet the same requirements specified for the TVM in Section 34 50 13 - Ticket Vending Machines, except that the provisions for power switches shall not apply to fare gates.

**PART 3 – EXECUTION**

Not Used

**END OF SECTION 34 50 16**